# The system of interest: housing

- Do you want to adjust the demographic projections to housing constraints?
  - This is what is done in the GLA projections
- Do you want to produce housing plans on the basis of demographic projections?
  - This is what is done in the ODPM regional planning guidances
- A household model needs to be added to the demographic model in either case

The system of interest: economy

- Economy = employment change (new jobs, job losses) which drives some migration streams (see graph which follows)

- Other work for ODPM has shown that the relationship between out-migration and economic conditions is complex and differs between life course stages

  - Champion, T., Fotheringham, S., Rees, P., Bramley, G. and others (2002) *Development of a Migration Model.* The University of Newcastle upon Tyne, The University of Leeds and The Greater London Authority/London Research Centre. Office of the Deputy Prime Minister, London. ISBN 1 85112 583 3. (http://www.odpm.gov.uk/stellent/groups/odpm_housing/documents/page/odpm_house_601865.pdf)

In-migration to Scotland: regression parameters for 5 potential determinants, 1988-2003

In-migration to Scotland
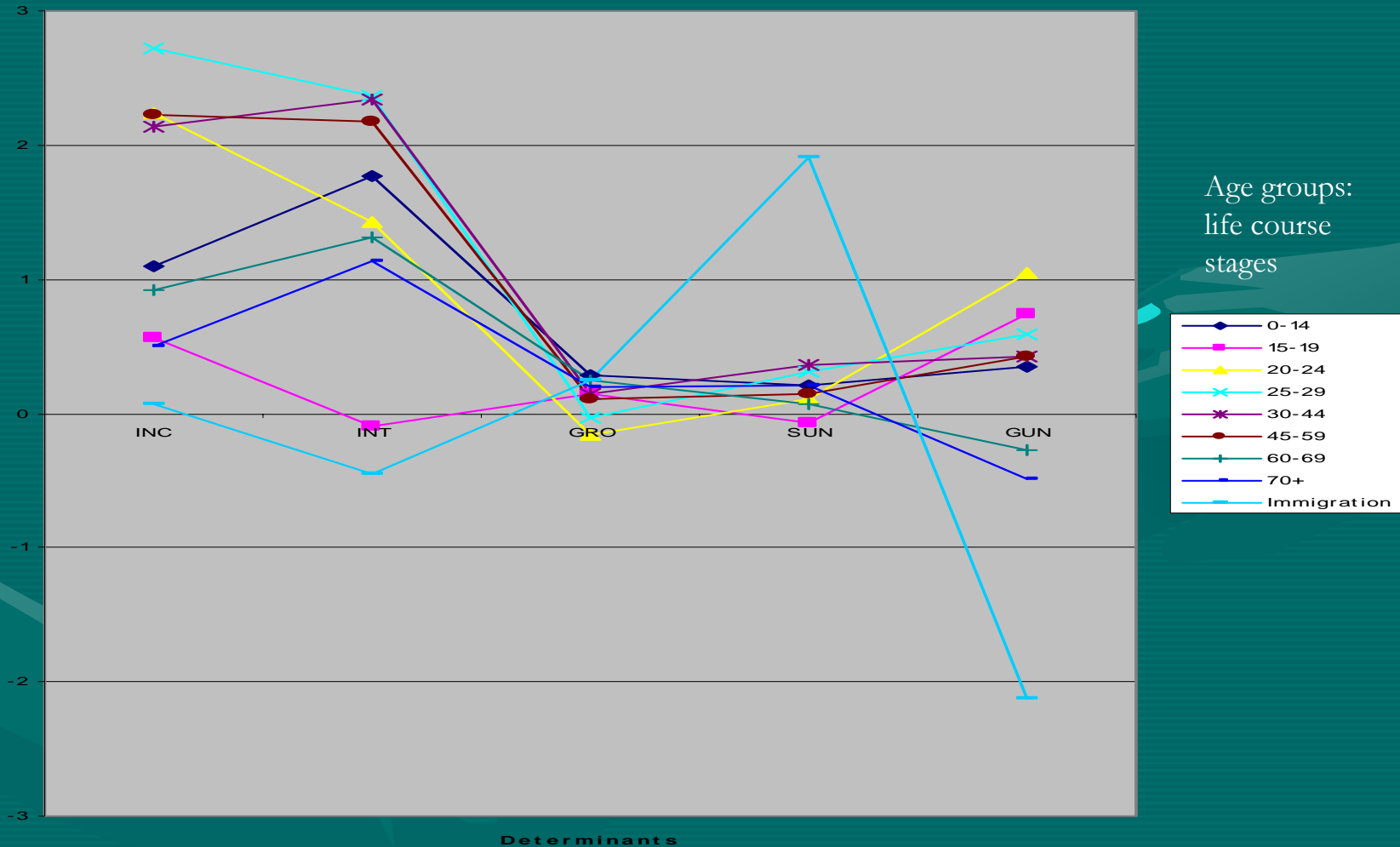
Age groups:
life course
stages

Legend:
- 0-14
- 15-19
- 20-24
- 25-29
- 30-44
- 45-59
- 60-69
- 70+
- Immigration

Determinants

INC=GDP/Pop   INT=Mortgage Interest Rate   GRO=GDP Growth Rate

SUN=Scotland Unemployment Rate   GUN=Greater South East Unemployment Rate

The modelling alternatives

- Macro demographic projection model
  - with household projection model added
  - with spatial interaction model for migration
- Macro demographic and economic model
  - with model of different economic sectors (e.g. interregional input-output model)
  - with migration model linking demographic and economic sectors
- Micro demographic simulation model
  - works with individuals (& households)
  - events to individuals change households
  - Attributes and behaviour added to individuals by sampling randomly macro probability distributions
  - Van Imhoff and Post (Population 1998) showed macro and micro models are equivalent with different costs/benefits
- Micro demographic and economic simulation model
  - There are demographic microsimulation models and models of home-job interactions but these are not married to simulation models of the establishments that offer jobs
- We look at just the first class of models, which are the most frequently used

Macro demographic projection models: Single region, bi-regional or multiregional?

- Single region = regions modelled separately, can be inconsistent unless constrained to national result
  - GAD model is single region (with consistent net flows)
  - Many local authority models are single region
  - IIASA Lutz et al models are (probably) single region (with consistent net flows)
- Strong case for the multiregional because it links in-migration to destination areas to origins
  - ONS SNPP model is multiregional
  - GLA borough model is multiregional
  - Eurostat NUTS 2 model is multiregional
  - UKPOP 1996 and UKPOP 2001 are multiregional models
- Biregional model is a two region model (region, rest of country) repeated N times
  - Suggested originally by Rogers 1975
  - Developed by Wilson (POPSTAR) for Australia

Multiregional models: handling big arrays

- The state-space for the model is theoretically very large: Origins × Destinations × Ages
  - E.g. for Scotland: $56 \times 56 \times 101 = 316{,}736 = 16$ persons per cell (lots of bigger cells, lots of smaller, lots of zeroes)

- So modellers look to reduce the space so that variables can be reliably computed
  - Scheme 1: O+ D+ A (independent) [56 + 56 +101 = 213]
  - Scheme 2: OA + DA (pool for each age) [56×101 + 56×101 = 11,312]
  - Scheme 3: OA + DA + OD (three faces model) [56×101 + 56×101 + 56×56 = 14,448]
  - Scheme 4: A + OA_1 + DA_1 + ODA_2 (intermediate model) [101 + 56×20 + 56×20 + 56×56×8 = 27,429]
  - Scheme 5: OA + DA + ODA_3 (ONS model) [56×101 + 56×101 + 56×56×6 = 30,128]
  - Scheme 6: ODA (full model) [56×56 × 101 =316,736]

- Best buy: Scheme 3 or equivalent
  - van Imhoff, E., van der Gaag, N., van Wissen, L. and Rees, P.H. (1997) The selection of internal migration models for European regions. *International Journal of Population Geography*, 3, 137-159.

Assumptions, scenarios and uncertainty

- Assumptions = trajectories of main demographic drivers of projections
- Scenarios = projections with alternative assumptions for particular purpose
- Uncertainty = probabilistic projections
  - See Wilson, T. and Rees, P. (2005) Recent developments in population projection methodology. *Population, Space and Place* 11, 337-360.
- There has been a radical shift in assumptions built into the 2004-based round of national population projections
- This shift has been influenced by consultations of experts by GAD and recent trends in fertility (higher?), mortality (lower) and international migration (much higher)

Thinking about assumptions

- Q: How has thinking about assumptions changed recently?

- Here I draw on discussion on the 5th May 2005 at the *National Population Projections Expert Advisory Group* meeting about assumptions for the next round of UK projections

- Present: staff from central government, local Government and Universities (discussion to be reported anonymously)

Thinking about fertility (1): key trends

- General agreement that tracking cumulative cohort fertility was the right approach
- There was an interesting upturn in period TFR in 2003-4 (1.65 to 1.75): need to investigate why
- There is a tempo effect at work: postponement of fertility into thirties ages but this must run out of steam soon
- The key decision was between no children and some children. Intentions show people want two children but "things" get in the way
- Child and family friendly policies (so far tried) will only achieve +0.1 child increase at most
- There may be a counter-effect from policies to reduce teenage fertility (UK highest in Europe)

Thinking about fertility (2): policies, composition and guesses

- Effect of stronger policies
  - There is recent evidence from France, Netherlands and Denmark of an upturn related to policies
  - We might have stronger policies: for each child you get a discount on pension contributions
  - Population is rising up the policy agenda because of the ageing-pensions-labour force links
- Composition shifts
  - The shift in population composition towards ethnic minorities with higher fertility might mean a 0.1 to 0.2 child increase in CFS by 2030
  - But ethnic minority fertility for some groups has already fallen to or below the ethnic majority level
  - There will also be a shift towards higher fertility regions
- My guess
  - CFS of 1.9 in 2030
  - Confidence interval: 10% 1.65
  - Confidence interval: 90% 2.15
  - But this could be because I have just become a grandfather!

Thinking about mortality (1): views

- Past errors
  - There was consensus among the academic experts that GAD/ONS had consistently under-estimated the decline in age-specific mortality and therefore underestimated the growth in the older population
  - This had resulted in poor decisions about pension schemes (funding, contributions, age at retirement).
- Don't stop the improvements
  - GAD/ONS assumed in the 2003 based projection that rates of decrease in mortality by age-sex groups, which currently vary between 0.5% and 5% (average about 2%), will converge on 1% by 2030 and halve every subsequent 25 years
  - The academic experts felt this still risked repeating the errors of the past and would under-estimate improvements
  - GAD has revised their view of mortality in the 2004-based projections

Thinking about mortality (2): reasons and caveats

- Reasons for this view:
  - UK has "vast room" to catch up with the best (Japan, Iceland, France, Italy)
  - UK has "vast scope" to introduce better programmes of prevention and treatment already proved elsewhere
  - UK has "vast room" to raise health care for the poorest sections of society to the care experienced by the richest
  - There are a large number of programmes and research seeking to improve treatments
- Caveats: this optimistic view assumes:
  - Continued economic growth
  - Life style epidemics (obesity related mortality, alcohol abuse mortality) can be prevented
  - Current infectious epidemics (e.g. HIV/AIDS, Hepatitis C, MRSA) can be contained/solved
  - The killer infections don't get loose (e.g. Avian flu, SARS, Ebola, Marburg)
  - Past favourable trends don't run out of steam (e.g. the effect of reduction in smoking behaviour on lung etc cancer and cardiovascular disease)

Thinking about migration (1): views of the experts

- The projection model uses net international migration. The UK has switched from being a net emigration country to being a country in balance or experiencing net immigration only since the 1970s with the 1990s seeing high immigration.

- The experts differed in their attitudes to immigration from very positive (me) to rather negative (a colleague). We had a lively debate as did the country in the weeks leading up to the General Election of 5 May. Both Labour and Conservative Parties were in favour of fair policies on immigration with firm controls.

- One expert argued that the UK would soon have to adopt a points based and quota system tied to labour market demands as practised by Canada, USA and Australia. Already Scotland has been given permission to encourage high skill immigration (and to suspend UK regulations).

- The experts were shy in putting forward figures for 2030, except me, who said +250k pa! With confidence interval +150k (10%) to +350k (90%). Little did I know that my guess for 2030 would be achieved in 2004.

Thinking about migration (2): labour demand drivers

- The 2010 to 2040 period will see the retirement of the baby boom cohorts (1945 to 1970) and a huge increase in the older UK population

- There will be increased health and care demands and a shrinking labour force

- Some labour demand can be met by shifting retirement age later and recruiting the young elderly to the health and care sector

- But there will be a huge demand for such labour from outside the UK

- Very important work has been carried out in Warsaw by Marek Kupiszewski and team on replacement migration projections which inform the debate about migration assumptions. See Bijak J., Kupiszewska D., Kupiszewski M., Saczuk K. (2005) Impact of international migration on population dynamics and labour force resources in Europe. CEFMR Working Paper 1/2005. Central European Forum for Migration Research: Warsaw. Available online at http://www.cefmr.pan.pl/docs/cefmr_wp_2005-01.pdf.

Thinking about migration (3) – new flows

- We discussed the migration from the A8 countries (now free to send migrants)

- The Government has published a report on the numbers registering for work (could have migrated before May 2004 & could have left before Sept 2004)

- Home Office, Department for Work and Pensions, Inland Revenue and Office of the Deputy Prime Minister (2004) *Accession Monitoring Report, May-September 2004.* Accessed from: http://www.homeoffice.gov.uk/rds/hosb1104.pdf.

Chart 1: Applicants applied by month applied. May – September.
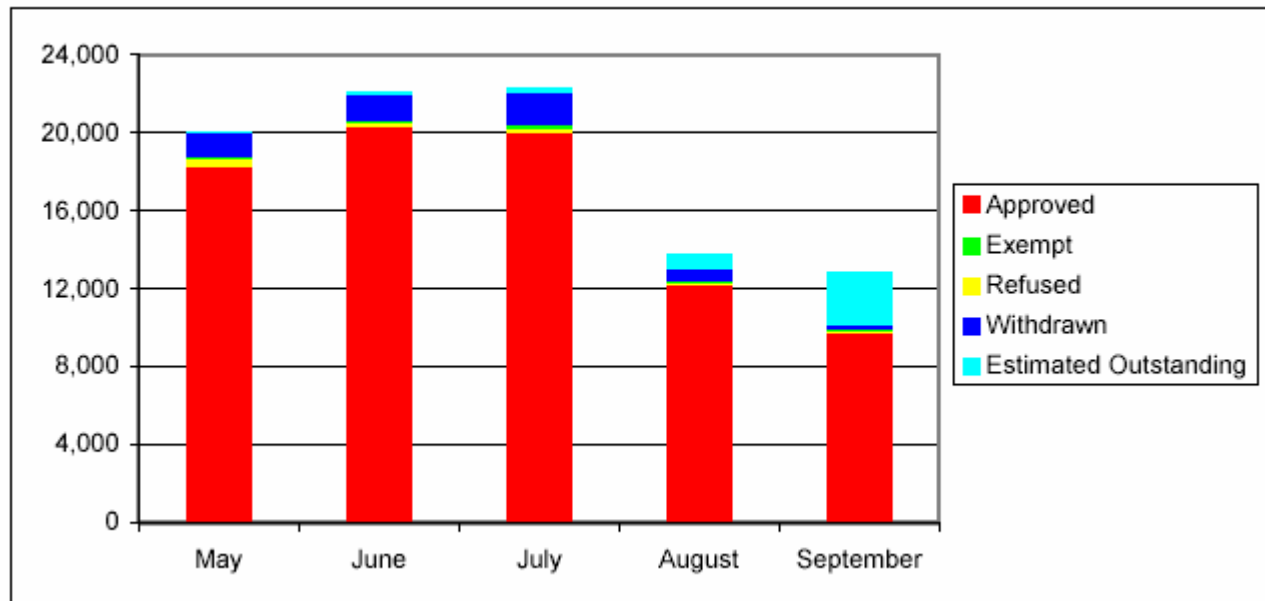
Thinking about migration (4) – students & families

- Student immigration to the UK is very important
- Universities compete hard to recruit from overseas to raise income (particularly from outside the EU because EU students pay UK fees)
- Measures to retain skilled graduates
  - Scotland issues 2 year work permits for any graduate (no questions asked)
  - Work permit applications can be approved by return of post!
- We also recognised the continuing importance of overseas marriages for British Asians

Future proofing the projections

- Software
  - Bespoke or package program or spreadsheet? Decision will depend on model adopted
  - Should the work by in-house or out-sourced?
  - Quality assurance will be needed
  - There should be consultation about methods
  - There should be a long term strategy for developing and migrating the projection model across platforms and operating systems
- Publication
  - It is vital to have good documentation
  - It is vital to publish all assumptions and results
  - There should be consultation about results